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FOREST PEST MANAGEMENT

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Arizona Cypress Seed Quality

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Abstract

An Arizona cypress seedlot from a private Arizona nursery had 42% sound seed, which is above average for cypress. No damping-off fungi were found contaminating the seed, but some of the associated molds (Penicillium sp. and Alternaria sp.) were weakly pathogenic. The seed was not stratified for this evaluation and 17% germinated.

Introduction

A private nursery in Arizona has experienced substantial losses in their Arizona cypress, apparently from damping-off. Nursery personnel were concerned that the current seedlot might be contaminated, and were referred to Region 3 Forest Pest Management (FPM) by the Westwide Nursery Specialist. Region 3 FPM forwarded a sample of seed to Region 2 FPM in late September 1987 for laboratory analysis.

According to Johnson (1974), Arizona cypress, Cupressus arizonica Green, is similar to other cypresses in having very low germination (1-30%), primarily due to low percentages of sound seed. Also according to Johnson (1974), cypress seed are often heavily contaminated with molds and bacteria.

The objective of this laboratory assay was to determine whether damping-off pathogens were contaminating the seed, to observe other microorganisms associated with the seed and their effects, and to measure the proportion of sound seed.

Materials and Methods

Seed was not stratified, but stored dry at 4 degrees C until the time of assay (three weeks after receipt). Small batches (110 to 150 seeds) of seeds were subjected to 3 treatments: no treatment, 16-hour soak in 3% hydrogen peroxide followed by a sterile water rinse, and 16-hour rinse in running tap water. Immediately after treatment, seeds were spread out onto 3 or 4 plates of each of 3 media: potato dextrose agar (PDA), Pythium-selective medium (PY)(Hendrix and Kuhlman, 1965), and Fusarium-selective medium (FU)(Nash and Snyder, 1962). PDA and FU plates were left under constant fluorescent lighting and PY plates were kept in the dark at room temperature. After 2 weeks, ungerminated seeds were cut open with a razor blade. Identification of the fungi associated with the seeds was attempted. Statistical testing was deemed unnecessary.

Results

Since Arizona cypress embryos, unlike the Pinaceae, evidently do not become green until germinating in the presence of light, it was not always clear whether some embryos were dormant or diseased. Seeds with soft white embryos were considered dormant unless the embryo and endosperm were partly liquefied, in which case they were considered diseased. In some cases the seed contents were liquefied, but no microorganisms grew from the seed, especially on the selective media. Not all fungi were identified, but species of Alternaria, Penicillium, Mucor, other Phycomycetes and Deuteromycetes, and bacteria grew from the seed. Of these, species of Alternaria, Penicillium, bacteria, and an unidentified Deuteromycete were associated with diseased seeds. Species of Alternaria and Penicillium also attacked germinating seedlings. These are usually weak pathogens under normal (field) conditions. The damping-off fungi, species of Pythium and Fusarium, were not detected.

Of the 390 seeds evaluated, 58% were dark and fibrous or hollow inside (unsound), 12% were dormant, 13% were diseased, and 17% germinated (6% becoming diseased) (Table 1). The hydrogen peroxide treatment seemed to increase germination (22.5% compared to 12.4% for untreated and 15.4% for tap water rinsed) and decrease disease (14.3% versus 21.3% for untreated and 21.5% for tap water rinsed). The PY medium seemed to depress germination.

Table 1. Percentages of Arizona cypress seeds in various conditions after two weeks on potato dextrose agar (PDA), Pythium-selective medium (PY), or Fusarium-selective medium (FU), following no treatment, 16-hour soak in 3% hydrogen peroxide, or 16-hour rinse in running tap water.

Treatment	Medium	No. of Seeds	Unsound	Diseased	Germinated Diseased	Germinated Healthy	Dormant
Untreated	PDA	32	40.6	28.1	0	0	31.3
	PY	38	52.6	21.1	0	2.6	23.7
	FU	43	58.1	11.6	4.7	25.6	0
total		113	51.3	19.5	1.8	10.6	16.8
Peroxide	PDA	48	50.0	4.2	8.3	27.1	10.4
	PY	48	64.6	14.6	6.3	0	14.6
	FU	51	58.8	9.8	0	25.5	5.9
total		147	57.8	9.5	4.8	17.7	10.2
Tap Water	PDA	42	59.5	9.5	21.4	2.4	7.1
	PY	47	61.7	17.0	8.5	0	12.8
	FU	41	68.3	7.3	0	14.6	9.8
total		130	63.1	11.5	10.0	5.4	10.0
TOTALS		390	57.7	13.0	5.6	11.5	12.1

Discussion

This Arizona cypress seedlot had 42% sound seed, which is above average (Johnson 1974). The unsound seed could never germinate, but the rest could potentially germinate if all pathogens were controlled and environmental requirements were met. Seeds that germinated and became diseased would probably have escaped the weak pathogens under field conditions (due to microbial antagonists in the soil). No damping-off pathogens were found contaminating the seed, but some losses to molds and bacteria should be expected during stratification. Johnson (1974) recommended Captan in the stratification medium, but there is still concern with phytotoxicity.

Cypress seeds should be stratified for 21 to 30 days at 34 to 41°F (Johnson 1974). Since the seeds were not stratified, germination was depressed, except for the hydrogen peroxide treatment. Stimulation of germination with hydrogen peroxide treatment without stratification has been seen in other conifers, but soaking in hydrogen peroxide prior to stratification tends to depress germination (Fuller and Hildebrand, 1985). The best option may be the procedure developed for pine and Douglas-fir by Wenny and Dumroese (1987). They gently agitate seeds in 40% bleach for 10 minutes, thoroughly rinse with agitation, and then rinse seeds in running tap water for 2 days prior to stratification. Experimentation with a small sample of seed from each new seedlot is recommended.

According to Johnson (1974), the preferred nursery practice is fumigation followed by spring sowing with stratified seed to produce 30 to 60 seedlings per square foot. A thin covering of soil and mulch with perlite or sponge rock is recommended. Johnson (1974) suggests a fungicide spray immediately after sowing as an added precaution against damping-off.

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